Claims

1. A process for purifying difructose dianhydride III (hereinafter referred to as DFA III) which comprises adding powdered active carbon to a DFA III containing purified solution containing DFA III of the purity 90% or more at a concentration of R-Bx 10-60 at a rate of 5% or less to the solid content, and after defecation, separating the liquid part from the solid part, concentrating the liquid part, followed by immediate crystallization.

2. A process as claimed in Claim 1, wherein a DFA III containing purified solution containing DFA III of the purity 90% or more at a concentration of R-Bx 40-55 is used.

3. A process as claimed in Claim 1 or 2, wherein the powdered active carbon is used at a rate of 5% or less to the solid content, preferably 0.1-3%.

4. A process as claimed in any one of Claims 1 to 3, wherein the average particle size of the powdered active carbon is 15-50 microns and the maximum particle size 200 microns or less.

5. A process as claimed in any one of Claims 1 to 4, wherein the solid-liquid separation is carried out by at least one operation selected from filtration with a filter aid, the use of a membrane filter, and the use of an ultrafilter membrane.

6. A process for purifying DFA III, which comprises

chromatographing at least one of intermediates produced in the total steps for purification from a DFA III containing solution to a DFA III product, and adding the resulting DFA III fraction in at least one step for purification.

7. A process as claimed in Claim 6, wherein among the DFA III fractions obtained by chromatography in Claim 6, a DFA III rich fraction containing DFA III of the purity 85% or more is used alone as a DFA III containing purified solution or added to a DFA III containing purified solution.

8. A process as claimed in Claim 7, which comprises adding powdered active carbon to a DFA III containing purified solution, to which the DFA III containing purified solution or the DFA III rich fraction as recited in claim 7 has been added, at a rate of 5% or less to the solid content, and after defecation, separating the liquid part from the solid part, concentrating the liquid part, followed by immediate crystallization.

9. A process as claimed in Claim 7 or 8, wherein DFA III of the purity 90% or more is used as the DFA III containing purified solution to be added to a DFA III fraction containing DFA III at a concentration of R-Bx 10-60.

10. A process as claimed in Claim 8 or 9, wherein the powdered active carbon is used at a rate of 5% or less to the solid content, preferably 0.1-3%.

11. A process as claimed in any one of Claims 8 to 10,

wherein the average particle size of the powdered active carbon is 15-50 microns and the maximum particle size 200 microns or less.

12. A process as claimed in any one of Claims 8 to 11, wherein the solid-liquid separation is carried out by at least one operation selected from filtration with a filter aid, the use of a membrane filter, and the use of an ultrafilter membrane.

13. A process for purifying DFA III, which comprises separating a syrup from crystals by crystallization in total purification steps from a DFA III containing solution to a DFA III product, and after further centrifugation to eliminate fine crystals, adding the syrup to at least one step for purification.

14. A process for purifying DFA III, which comprises adding powdered active carbon to a DFA III crude solution for purification at a rate of 5% or less, preferably 0.1-3%, to the solid content, the DFA III containing crude solution containing DFA III of the purity 60% or more at a concentration of R-Bx 10 or more, and after defecation, separating the liquid part from the solid part, concentrating the liquid part, followed by immediate crystallization.

15. A process as claimed in Claim 14, wherein the DFA III containing crude solution is at least one of a DFA III containing solution, a DFA III fraction obtained by

chromatography, a crystal or crude crystal syrup.

16. A process as claimed in Claim 14 or 15, wherein the average particle size of the powdered active carbon is 15-50 microns and the maximum particle size 200 microns or less.

17. A process as claimed in any one of Claims 14 to 16, wherein the solid-liquid separation is carried out by at least one operation selected from filtration with a filter aid, the use of a membrane filter, and the use of an ultrafilter membrane.

18. A process as claimed in any one of Claims 15 to 17, wherein the DFA III containing solution is an enzyme reaction solution produced by action of fructosyltransferase on inulin.

19. A process as claimed in Claim 18, where in inulin of which the polymerization degree of fructose is 10 or more is used.

20. A process as claimed in any one of Claims 18 to 19, wherein inulin of which the polymerization degree of fructose is 10-60 is used.

21. A process as claimed in any one of Claims 18 to 20, wherein an inulin fructotransferase (depolymerizing) is used as a fructosyltransferase.

22. A process as claimed in Claim 21, wherein as an inulin fructotransferase (depolymerizing), at least one of a purified enzyme, crude enzyme, enzyme-containing material, the cells, the culture, and its processed material derived from

Arthrobacter sp. AHU 1753 strain (FERM BP-8296) is used.

23. Crystals, crushed crystals or granular crystals of DFA III of which the purity is 95w/w% or more prepared according to a process as claimed in any one of Claims 1 to 22.

24. A process for producing a DFA III containing solution, which comprises making a fructosyltransferase act on inulin of which the polymerization degree of fructose is 10 or more, preferably 10-60.

25. A process as claimed in Claim 24, wherein an inulin fructotransferase (depolymerizing) derived from Arthrobacter sp. AHU 1753 strain (FERM BP-8296) is used as a fructosyltransferase.

26. A process as claimed in Claim 25, wherein inulin of which the polymerization degree of fructose is 10 or more, preferably 10-60 and the polysaccharide content is 80% or more is used.

27. A process as claimed in Claim 26, wherein inulin of which the polysaccharide content is 100% is used.

28. A process as claimed in Claim 26 or 27, wherein the fructosyltransferase is a purified enzyme.

29. A process for producing highly pure crystals of DFA III, which comprises producing a DFA III containing solution in a process as claimed in Claim 28, chromatogrpahing the solution, and immediately concentrating and crystallizing the resulting DFA III rich fraction.

30. A process for purifying difructose dianhydride III (hereinafter referred to as DFA III), which comprises treating a DFA III containing solution containing DFA III of which the purity is less than 70%, by a method selected from at least one of treatment with yeast, defecation and filtration and chromatography.

31. A process for purifying DFA III as claimed in Claim 30, wherein the DFA III containing solution is at least one of a solution produced by action of a fructosyltransferase on a fructose polymer or a material containing fructose polymer, condensate thereof, syrup for crystallization and separation, and a mixture of one or more of them.

32. A process for purifying DFA III as claimed in any one of Claims 30 to 31, wherein the treatment with yeast is carried out by adding yeast to the DFA III containing material, followed by incubation under aeration.

33. A process for purifying DFA III as claimed in any one of Claims 30 to 31, wherein the defecation and filtration comprises treatment with powdered active carbon and solid-liquid separation.

34. A process for purifying DFA III as claimed in any one of Claims 30 to 31, wherein the defecation and filtration of the syrup for crystallization and separation is accomplished by continuous centrifugal separation.

35. A process for producing a fructosyltransferase,

which comprises incubating a microorganism producing a fructosyltransferase on a culture medium containing inulin.

36. A process as claimed in Claim 35, wherein a culture medium containing inulin at a content of 0.1-10%, preferably 0.5-5%, is used.

37. A process as claimed in any one of Claims 35 to 36, wherein a culture medium further containing an yeast extract is used.

38. A process as claimed in Claim 37, wherein the culture medium containing an yeast extract at a content of 0.02-2.0%, preferably 0.1-1.5%, is used.

39. A process as claimed in any one of Claims 35 to 38, wherein the aeration is set at 0.5 vvm or more, preferably 1-2 vvm during incubation.

40. A process as claimed in Claim 35, wherein the fructosyltransferase is at least one selected from inulase, inulin fructotransferase (depolymerizing), inulin fructosyl-β-1,2-fructofuranosyltransferase (cyclizing), and cycloinulooligosaccharide fructanotransferase.

41. A process as claimed in any one of Claims 35 to 40, wherein a large amount of enzyme is produced in a large-scale apparatus for cultivation of microorganisms using a huge fermentation tank of 50 liter volume or more, preferably 100 liters or more.

42. A bacterium producing a fructosyltransferase,

Arthrobacter sp. AHU 1753 strain (FERM BP-8296).